4993

Diag. Ckt. No. 5502-2

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No. .... Office No. 4993

LOCALITY

State California

General locality Point Reyes

Locality to Havens Anchorage.

1929

CHIEF OF PARTY

F. B. T. Siems

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Form 537

REG. NO. 4993

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

HYDROGRAPHIC TITLE SHEET

The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

Field No. 123

REGISTER NO. 4993

State California

General locality Offshore, ~~north central portion~~ Pt. Reyes

Locality ~~Havens Anchorage to~~ Point Reyes to Havens Anchorage

Scale 1:120 000 Date of survey Sept. 18-Dec. 5., 1929

Vessel U.S.C.& G.S.Str. DISCOVERER

Chief of Party F. B. T. Siems, H.& G.E.

Surveyed by F. B. T. Siems, H.& G.E.

Protracted by Herman Odessey, H.& G.E.

Soundings penciled by Herman Odessey, H.& G.E.

Soundings in fathoms ~~feet~~

Plane of reference Mean lower low water

Subdivision of wire dragged areas by

Inked by Warren H Bamford, A L Shalowitz

Verified by WHB and A. L. Shalowitz.

Instructions dated March 25, 1929

Remarks:

DESCRIPTIVE REPORT

TO ACCOMPANY HYDROGRAPHIC SHEET NO. 123

SCALE 1:120,000

COAST OF NORTHERN CALIFORNIA

HAVENS ANCHORAGE TO POINT REYES

INSTRUCTIONS DATED MARCH 25, 1929

F. B. T. SIEMS, H. & G. E., CHIEF OF PARTY

U. S. C. & G. S. STR. DISCOVERER

FIELD WORK DONE: SEPT. 18 - DEC. 5, 1929

LIMITS: The work covered by this sheet extends from a junction with ship sheets numbers 43 and 44 of the present season in approximate longitude 123° 30', westward to a line joining the northwest corner of chart No. 5502 with the southeast corner of chart No. 5602, in approximate longitude 124° 20', and from a junction with sheet number 122 on the north to a junction with the work done by the Str. PIONEER during the 1929 field season.

SOUNDING METHODS: Bombs positions were usually taken at intervals of ten to thirty minutes, depending on the spacing of the sounding lines. In extreme cases, when running crosslines over the offshore area, and when the supply of TNT was low, the interval was allowed to increase to as much as one hour.

Inside the 1000 fathom curve, the general scheme of sounding lines runs parallel to the shoreline, while outside that curve the sounding lines run normal to the coast. By extending these latter lines inshore, suitably spaced crosslines were obtained inside the 1000 fathom curve.

Tin can bombs, containing the desired amount of TNT were used for the greater part of the sheet. Whenever the explosions from the quart bomb could not be picked up by the shore stations, it was necessary to fire larger bombs. For this purpose, cast iron bombs, similar to anarchists bombs, were used, and found to be very satisfactory. Two different sizes of these were used, the smaller containing three pounds of TNT, and the larger five pounds. Generally speaking, half pint bombs were good for distances up to about 40 sound seconds, pints for about 10 seconds further, and quarts for about 10 or 15 seconds more. Outside of these distances it was usually necessary to fire cast iron bombs. Under unusually favorable conditions one of the shore stations picked up the report from a one-half pint bomb at a distance equal to 100 sound seconds.

Probably the most important factor affecting the reception of the bomb signals is the presence of banks and shoals between the ship and shore station. The bomb signals seem to come in best when the slope is gentle and there are no obstructions in the path of the sound wave propagated by the bomb explosion.

Soundings on this sheet were obtained by means of the fathometer. The red light method was used to as great a depth as possible. In general the limiting depth for the red light soundings was reached around 350 to 400 fathoms, although occasionally red light soundings were obtained in 450 to 500 fathoms. Beyond these depths the white light method was used. The disc speed was kept constant by adjusting the rheostat to keep the middle reed of the tachometer vibrating. This adjustment was usually necessary only when the ship was stopped for vertical casts, when the change in steam pressure would cause a variation in the generator voltage. Repeated tests in the field failed to indicate any appreciable change in the fathometer soundings on account of moderate variations in the disc speed. Accordingly, no corrections were entered in the sounding records on this account.

Whenever the personnel was available, white light soundings were taken by two officers simultaneously, and both readings entered in the sounding record. The name of the officers taking the soundings are also recorded in the sounding volumes. When only one officer was available for this duty, his readings were roughly checked by the recorder on watch.

Vertical casts were taken at suitable intervals over the entire area of the sheet in order to obtain comparisons with the fathometer soundings, bottom specimens and temperatures, water samples and surface temperatures, and serial temperatures. At all vertical casts, the ship was handled by the commanding officer, who exercised great care in keeping the wire vertical. In a few cases ~~Whenever~~ weather conditions made it impossible to keep the wire vertical, and the amount of slant was carefully estimated and noted in the record. At all vertical casts when comparisons were made with the white light fathometer soundings, independent fathometer soundings were taken by each officer on the ship and recorded opposite his name before the wire sounding was announced, in order to obtain the personal equations of the officers in reading the fathometer. The results of these tests were later tabulated and analyzed, and the personal equations determined. This method of determining personal equations is open to the objection that the tests are taken when the ship is stopped, while on a sounding line the ship is always under way. However, the tests do give some indication that some officers are prone to read deeper than others.

The sheaves were tested at the beginning and end of the field work, and the results entered in the record. Although the corrections in each case are less than the 1% allowed, the actual corrections in the greater depths were sometimes as large as 10 fathoms. Since the white light soundings are ordinarily read to within 5 fathoms, it was decided to apply the sheave corrections to the vertical cast soundings.

Red light soundings were taken at one-half minute intervals, while white light soundings were taken at intervals of 2 to 5 minutes, depending on the depth.

Using a tuned hydrophone for the deeper soundings, no difficulty was experienced in getting good echoes in even the deepest water found in the area covered by this sheet. Under favorable conditions, a double echo could often be heard. For the red light soundings, it was found that there were fewer strays when a Submarine Signal Corporation "rat" type hydrophone was used.

VALOCITY CORRECTIONS: The index error to the fathometer red light soundings was practically constant, and was determined by comparing the vertical casts with the corresponding fathometer soundings already corrected for temperature. This correction amounted to 0.6 fathom. Attached to this report is a table showing temperature and velocity corrections for both the red and white light soundings.

SLOPE CORRECTIONS: Slope corrections were computed in the usual manner, except that the slopes were determined by scaling the distances between the depth curves, rather than by computing from the soundings and the distances between them. In some cases it was necessary to smooth out the depth curves a little, in order to give the bottom a more natural appearance and to avoid what would be abnormally large corrections. The depth curves were carefully drawn on the boat sheet, and the slope corrections determined with the aid of a celluloid scale.

Slope corrections were applied in accordance with S.P. 165. A.L.S.

CROSSINGS: The average of 57 red light sounding crossings on this sheet is 0.7 fathom, with a maximum of 4 fathoms. There were two 4 fathom crossings and two 3 fathom crossings.

The average of 122 white light sounding crossings on this sheet is 9 fathoms, with a maximum of 100 fathoms. There were 5 crossings of over 50 fathoms.

CONTROL: All of the control for this sheet was by means of R-A-R. At station HAVEN in location, lat. 38° 47' 32.04" (988 m), long. 123° 35' 18.85" (455 m), a hydrophone was used, while at station DUNCAN in location, lat. 38° 23' 31.70" (977 m ~~1161 m~~), long. 123° 05' 49.70" (12061 m), a magnetophone was used. Station FARALLONE, in location, lat. 37° 41' 33.55", long. 123° 01' 24.32", established by the Str. PIONEER , was used in the survey of the southwest part of the sheet. The use of this third station afforded an opportunity to obtain distances to three stations simultaneously, and thereby determine the velocity of sound for the offshore area covered by the sheet.

The positions of the R-A-R stations were determined at the time they were established by means of sextant angles taken to triangulation stations. The positions were plotted on the topographic sheets and then scaled off for transferring to the R-A-R sheets.

Early in November a serious leak developed in the cable at station HAVEN, and it was necessary to lay down a new hydrophone and cable there. This was done on November 13th. The position of hydrophone No. 2, in location 38° 47' 31.29" (965 m), long. 123° 35' 18.30" (440) was approximately 25 meters southeast of hydrophone No. 1. On the 1:120,000 scale sheets, this difference is small enough to be neglected, and the position of hydrophone No. 1 was accordingly used throughout the plotting of the entire sheet.

At station DUNCAN the magnetophone was supplemented by a hydrophone, located 8 meters 120 degrees from the magnetophone. The hydrophone was used on only a few bonb positions.

NEW METHODS: This season a new method was developed on the Str. DISCOVERER for plotting R-A-R positions. The method consists essentially in substituting time circles for distance circles, and in the use of a circular plotting scale designed especially for the purpose. The new method was tried out in the field on boat sheets 122, 123, 43, and 44, and proved so successful that it was decided to use it in plotting all of the R-A-R smooth sheets.

In locating the time circles on this sheet the following method was used: Along the east and west, and north and south lines through each R-A-R station, geographic positions were determined at intervals of ten seconds, using a base velocity of 1481 meters per second. Points were similarly computed for one diagonal from HAVEN, one diagonal from DUNCAN and two diagonals from FARALLON. The ten second intervals were then subdivided equally, thereby obtaining positions of points on the five second circles. Using the distance from the R-A-R station to the computed position of a point on one of the circles as a radius, and shifting the position of the center from the hydrophone location where necessary, the time circles were made to pass through the respective positions of the computed points. The amount that the center must be shifted from the true location of the hydrophone is in a way a measure of the accuracy of the projection. A check on the computing and plotting of the points through which the circles are drawn is obtained by testing the alignment and spacing of the points on any one radial line. By using a sufficient number of radial lines from each R-A-R station, the positions of the time circles can be determined with practically the same degree of accuracy as the plotting of triangulation stations.

Time circles sheets possess the following advantages over distance circle sheets:

(1) The plotting of a position requires only a small fraction of the

time required with the old method. This results from the combination of the plotting scale and type of sheet, rather than from the use of each one independently. With a little practise in manipulating the plotting scale, a bomb position can be plotted in from ten to thirty seconds. This is a decided advantage when plotting on the boat sheet.

(2) All errors incident to converting units of time into distance are done away with in the elimination of this step.

(3) The speed and accuracy with which positions can be plotted by this method are practically independent of the vibration of the ship when under way.

(4) The new method, which consists essentially in making the circles on the scale tangent to the circles on the sheet, is remarkably accurate in plotting what would ordinarily be considered a weak fix.

(5) The common error of one or more whole seconds in scaling the tape or calculating the net time can be detected at once by comparison with the dead reckoning position scaled from the boat sheet in terms of units of time.

(6) The work incident to computing the final distances, after the final velocities have been adopted, consists only in applying a percentage correction to the net scaled time on account of the difference between the actual and assumed velocities. This correction in hundredths of a second is readily obtained from a table constructed for that purpose. The saving in office work on this one operation is considerable.

(7) In as much as the plotting scale has on it the correct spacing of the time circles, there is a constant check on the distortion of the sheet. This distortion can be readily corrected for by measuring on the scale from both the center and the outside circle at the same time, and making the proper adjustment when plotting a position. The operation corresponds to scaling

from both parallels and meridians when plotting a triangulation station.

PLOTTING SCALE: The plotting scale is made of transparent material (celluloid), and consists of a series of concentric circles spaced at regular intervals, corresponding to tenths of a sound second in distance, from zero at the center to five seconds at the outside. Circles representing whole and half seconds can be distinguished from the rest by colors or other characteristic markings.

In making the scale, dividers were set for the distances used as radii for the circles, and the settings tested by marking off diameters on a spare piece of celluloid. This piece of celluloid was then placed over a metric scale and the diameter accurately measured to see if any adjustment was necessary. Using this method of testing the radii before scratching the circles on the scale, no difficulty was experienced in making the scales accurately. A small piece of very thin brass was glued to the celluloid to provide a center that would not enlarge as the circles were being inscribed.

In use, the scale is manipulated until the desired arcs thereon are made tangent to the circles drawn on the sheet. The radius of the arc on the scale in each case equals the residual between the net time to each R-A-R station and the time circle nearest the bomb position. The scale is subdivided into tenths of sound seconds. The hundredths are easily interpolated.

The scale used in plotting smooth sheet No. 123 is forwarded herewith to facilitate the checking of the sheet.

VELOCITIES: For the purpose of laying down the time circles on the sheet, it was necessary to adopt some base velocity, equal to that value which was found to be correct over the greater portion of the sheet. Since the actual velocities, as determined by tests made in various parts of the sheet, were found to bear a definite relationship to the depth, it was necessary, before plotting positions on the sheet, to convert each bomb distance into the units for which the time circles were drawn. For example, when the actual velocity is 1485 meters per second, and the net scaled time 40 seconds, the distance in sound seconds must be multiplied by the ratio 1485:1481 before plotting on this sheet, on which the time circles are drawn for a base velocity of 1481 meters per second. This conversion amounts to applying a percentage correction to the net times as scaled from the chronograph tape. The amount of the correction is readily obtained from a table constructed for that purpose. Incidentally this operation corresponds to the computing of the final distances and requires only a small fraction of the time necessary with the old method.

The following tabulation gives the velocities used on sheet 123:

Depth in fathoms	Velocity in meters / sec.
0 - 100	1490
100 - 300	1489
300 - 500	1488
500 - 700	1487
700 - 900	1486
900 - 1100	1485
1100 - 1300	1484
1300 - 1500	1483
1500 - 1700	1482
1700 - 1900	1481
1900 - 2100	1480

The table of corrections, a copy of which is included in this report, gives corrections, in hundredths of a second, to be applied to the net scaled times to convert from units of actual velocity into units of 1481 meters per second, for which the circles on this sheet were drawn. The arguments in the table are actual velocity in meters per second, and net distances in sound seconds as scaled from the chronograph tapes. The corrections are added or subtracted, depending on whether the actual velocity is greater or less than the base velocity used in laying out the time circles.

The following procedure was followed in computing the final distances and entering them in the bomb record: In the columns headed "Velocity of sound in meters per second" are shown both the assumed velocity, in this case 1481, and the actual velocity as determined from tests. The column headed "Distance in meters" has been changed to read "Distance in units of 1481 meters each". In this division, in the column headed "Assumed", appears the net scaled times, and underneath, the correction on account of the difference between the actual and base velocities. In the column headed "final" is the distance in units of 1481 meters each. These are the distances used in plotting the smooth sheet.

At times, when the bomb signals did not come in strongly enough to trip the relay at the shore stations, the operators would be instructed to listen for the bomb signal and trip the relay by hand. Tests were made frequently to determine the lag between the "hand and ear" of each shore station operator, and the correction so determined applied to the scaled time to get the net distance. This correction was 0.33 second for Darton, the operator at HAVEN and 0.25 second for Allam, the operator at DUNCAN.

The method of determining the velocities for the area covered by this sheet is fully covered in a special report on velocities accompanying this season's descriptive reports.

REMARKS: The following scheme was used in marking positions on the smooth sheet: Bomb positions, at which distances to two R.A.R. stations were determined, are shown on the sheet by blue dots. Log positions are shown by green dots. Distances to one or three R.A.R. stations are shown by small arcs colored to correspond to the time circles.

LOG: During the course of field work on this sheet, the log was read on all bomb positions and at every even quarter hour, the idea being that the log readings would not only serve as a check on the bomb distances, but would also be a measure of the variations in speed between positions. Unfortunately the log never did function well due to a defective universal joint. Successive log readings failed to agree with corresponding elapsed times by wide margins. For this reason time was given more weight than the log readings in plotting the dead reckoning and spacing the soundings.

DISCREPANCIES BETWEEN BOAT AND SMOOTH SHEETS: There are slight discrepancies between the positions plotted on the boat sheet and the corresponding positions on the smooth sheet. These differences are due to the fact that a constant assumed value for velocity was used in determining the bomb distances for plotting on the boat sheet, while the actual velocities were used in getting the smooth sheet distances. In addition there was a station lag of 0.17 second at HAVEN, which was not applied in plotting the boat sheet.

The station lag at HAVEN was discovered on September 21st, when it was observed that bomb distances to HAVEN failed to agree with visual fix positions taken simultaneously by an unreasonably large amount. Inasmuch as the distances from the hydrophone were all small, the discrepancies could be accounted for by only two possibilities, (1) that the hydrophone had been dragged from its original position, (2) that there was a lag in the recording apparatus of the ship or shore station.

On September 23rd, the ship circles around the hydrophone at HAVEN, firing detonator caps and taking visual fixes simultaneously. Using the visual fixes as centers, and the bomb distances to HAVEN as radii, a series of arcs were drawn around the hydrophone location. The series of arcs thus obtained formed a regular circle around the hydrophone, proving conclusively that the hydrophone remained in its original position, and that the lag was constant and equal to the radius of this circle.

The ship's equipment was carefully checked over and everything found in good order. The shore station equipment was also overhauled, but it was not until October 14th that the cause of the lag was discovered there, and steps taken to remove it.

The following message was received from the operator at HAVEN on October 14th, and sets forth the measures taken to remove the lag:

"Made adjustment on relay magnets by bringing them closer to armature, thereby increasing pulling force. Made adjustment of tension spring so it would release armature at 5 mills increasing potentiometer resistance one half making total resistance approximately 220 ohms. Relay armature was acting sluggish so investigated and found bearings slightly dusty and too tight so released tension on them to speed up action. Made tests with spare hydrophone and stop watch to check speed and since change has been made find it working o. k."

(signed) DARTON.

On October 18th, additional tests were made as explained above, and indicated the entire removal of the lag.

Lacking evidence to the contrary, it was assumed that the lag was present from the time that the station was established until October 14th, and the records have been corrected accordingly.

Positions 24-40 "Q" day, sheet No. 4988 44, plotted outside the limits of that smooth sheet, and were therefore plotted on sheet no. 123. The corrections to the net times as shown in red on the right hand page of the bomb record apply to these positions for the plotting on sheet No. 4993 123 only, on which the time circles are drawn for a velocity of 1481 meters per second.

SHOALS: In the area covered by this sheet there is only one shoal of importance. This is Cordell Bank, which was developed by a combination of R.A.R. and visual fix work. The R.A.R. is plotted on the sheet proper, while the visual fix work is plotted on an insert on a scale of 1:40,000. In doing the visual fix work angles and azimuths were taken to buoys planted on the bank. The method of locating the buoys is described in Appendix 1.

In doing the visual fix work, positions were obtained by measuring the inclined angle between the sun and one of the buoys, and the angle between two adjacent buoys, at the same time observing the altitude of the sun. The inclined angle between the sun and buoy was reduced to a horizontal angle. From the azimuth of the sun and the angles between the sun and buoys, the azimuths to both buoys were obtained, thereby determining the positions.

Soundings were taken by means of the fathometer, and hand lead and machine. This latter method is fully described on page 46 of the hydrographic manual. In several instances soundings were taken by both methods simultaneously. Where the fathometer sounding is less than the leadline sounding, the discrepancy is due to the leadline not being vertical. In these instances the fathometer soundings are considered more reliable.

ANCHORAGES: There are no anchorages in the area covered by this sheet.

LANDMARKS: There are no landmarks or aids to navigation in the area covered by this sheet.

JUNCTION AND COMPARISON WITH PREVIOUS SURVEYS: There were no previous surveys in the area covered by this sheet. A satisfactory junction was made with the work done by the Str. PIONEER to the southward of this sheet.

REMARKS: The shoalest sounding on sheet No.123 is 23 fathoms on Cordell bank. The sounding was obtained 180 meters northeast of Buoy "C".

Herman Odessey,
H. & G. Engineer.

approved:
F.B.T. Siems
C.O.

TIDAL NOTE - - - - - SHEET 123

Portable automatic tide gauge No. 133 at Mendocino Bay, California, in latitude 39° 18', longitude 123° 48', and standard automatic tide gauge No. 211 at Arena Cove, California, in latitude 38° 55', longitude 123° 43', were used in reducing the soundings on this sheet. The Director's letter of January 3, 1930, permits either to be used without correction. The tabulations for lowest and highest tides observed have not been made.

OSCILLATOR AND HYDROPHONE LOCATION

The distance between the location of the oscillator and hydrophone, which was used in obtaining red light soundings, was 22 feet. The altitude of the isosceles triangle produced by the sound traveling from the oscillator to the bottom and hence to the hydrophone would be the correct depth while the fathometer reading would be equal to the sides of the traingle. In the solution for the altitude of the triangle for various depths obtained by the fathometer, it was determined that the difference between the altitude(correct depth) and the fathometer reading was so small that no correction need be applied to the soundings.

With the white light method the distance between the location of the oscillator and hydrophone was 6 feet. In considering the correction to soundings due to the ships run, it was determined that for the maximum depth obtained that no correction was necessary. The ships run in this instance is used as the base of the isoscles triangle and the computation would be the same as mentioned above.

STATISTICS, SHEET NO. 123

DATE	LETTER	STAT. MI. FATH.	STAT. MI. TOTAL	BOMB	POSITIONS VISUAL	POSITIONS D.R.	POSITIONS TOTAL	SOUNDINGS RED LT.	SOUNDINGS WHITE LT.	SOUNDINGS VERT. CASTS	SOUNDINGS H.L.	SOUNDINGS TOTAL
Sept. 18	A	138.5	138.5	33	0	0	33	75	168	2		245
19	B	83.1	83.1	25	0	0	25	211	83	1		295
20	C	90.8	90.8	22	0	3	25	72	83	0		155
21	D	18.9	18.9	9	0	2	11	262	0	0		262
24	E	150.0	150.0	24	0	0	24	6	142	2		150
25	F	46.0	46.0	13	0	0	13	6	53	0		59
26	G	60.0	60.0	21	0	0	21	76	94	4		174
Oct. 3	H	124.0	124.0	41	0	0	41	55	265	1		321
4	J	46.0	46.0	12	0	0	12	0	54	0		54
15	K	104.0	104.0	46	0	0	46	413	58	3		474
16	L	120.8	120.8	49	0	0	49	162	220	6		388
21	M	70.2	70.2	15	0	0	15	24	113	0		137
22	N	168.0	168.0	33	0	0	33	0	177	0		177
31	P	101.8	101.8	21	0	0	21	25	125	0		150
Nov. 1	Q	110.0	110.0	19	0	0	19	0	118	2		120
5	R	132.0	132.0	29	0	0	29	0	259	1		260
6	S	78.8	78.8	12	0	0	12	0	103	1		104
18	T	69.0	69.0	28	0	0	28	249	44	1		294
19	U	127.0	127.0	51	0	0	51	577	13	0		590
20	V	94.0	94.0	34	0	0	34	381	38	0		419
21	W	47.0	47.0	17	0	0	17	210	5	1		216
27	X	82.8	82.8	32	2	0	34	338	32	0		370
Dec. 2	Y	2.0	2.0	2	1	9	12	17	0	0		17
3	Z	10.5	10.5	0	34	0	34	130	0	0	62	192
4	Aa	13.6	13.6	3	53	0	56	23	0	0	215	238
5	Bb	28.0	28.0	0	63	0	63	722	0	1	2	725
TOTALS		2116.8 346.68	2116.8 346.68	591	153	14	758	4034	2247	26	279	6586

70

2111

CORRECTIONS TO RED LIGHT SOUNDINGS

SHEET 123

DEPTH	TEMP. CORR. FOR MAX. DEPTH	INITIAL CORRECTION	TOTAL CORRECTION	CORRECTION USED
fms	fms	fms	fms	fms
0 - 15	- 0.3	- 0.6	- 0.3	- ½
16 - 45	0.8	0.6	- 0.2	0
46 - 75	1.3	0.6	0.7	+ ½
76 - 125	2.0	0.6	1.4	1
126 - 250	3.2	0.6	2.6	2
251 - 375	4.2	0.6	3.7	3
376 - 450	4.5	0.6	3.9	4

CORRECTIONS TO WHITE LIGHT SOUNDINGS

SHEET 123

DEPTH	CORREC-TION	DEPTH	CORREC-TION	DEPTH	CORREC-TION	DEPTH	CORREC-TION
fms	fms	fms	fms	fms	fms	fms	fms
100		1000		1490		1840	
	2		12		22		32
200		1060		1530		1870	
	3		13		23		33
340		1120		1575		1895	
	4		14		24		34
440		1160		1620		1920	
	5		15		25		35
560		1220		1650		1950	
	6		16		26		36
669		1260		1690		1975	
	7		17		27		37
740		1300		1720		2000	
	8		18		28		38
820		1350		1750		2030	
	9		19		29		39
880		1400		1780		2050	
	10		20		30		40
940		1450		1810		2075	
	11		21		31		41
1000		1490		1840		2090	

CORRECTIONS ON ACCOUNT OF DIFFERENCE BETWEEN BASE AND ACTUAL VELOCITIES.
FOR BASE VELOCITY OF 1481 METERS PER SECOND.

Net Time in Seconds	Actual Velocity in Meters Per Second.								
	1482 1480	1483 1479	1484 1478	1485	1486	1487	1488	1489	1490
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
2					0.01	0.01	0.01		
3			.01	.01				.02	.02
4		.01				.02	.02		
5					.02			.03	.03
6				.02			.03		.04
7						.03		.04	
8	.01		.02		.03		.04		.05
9						.04		.05	
10				.03			.05		.06
11					.04			.06	.07
12		.02				.05	.06		
13			.03	.04				.07	.08
14					.05	.06	.07	.08	.09
15									
16							.08	.09	.10
17				.05	.06	.07			
18			.04				.09	.10	.11
19		.03				.08			.12
20					.07			.11	
21				.06		.09	.10		.13
22								.12	
23	.02		.05		.08		.11		.14
24						.10		.13	.15
25				.07			.12	.14	
26		.04			.09	.11			.16
27							.13	.15	
28			.06	.08					.17
29					.10	.12	.14	.16	.18
30									
31						.13	.15	.17	.19
32				.09	.11				
33			.07				.16	.18	.20
34		.05				.14			.21
35					.12		.17	.19	
36				.10		.15			.22
37								.20	
38	.03		.08		.13		.18	.21	.23
39				.11		.16			.24
40					.14		.19	.22	
41		.06				.17			.25
42			.09				.20	.23	.26
43				.12	.15				
44						.18	.21	.24	.27
45									
46					.16	.19	.22	.25	.28
47			.10	.13					.29

CORRECTIONS ON ACCOUNT OF DIFFERENCE BETWEEN BASE AND ACTUAL VELOCITIES.
FOR BASE VELOCITY OF 1481 METERS PER SECOND.

Net Time in Seconds	Actual Velocity in Meters Per Second.								
	1482 1480	1483 1479	1484 1478	1485	1486	1487	1488	1489	1490
48			.10	.13			.23	.26	
49		.07			.17	.20			.30
50				.14			.24	.27	
51	.03	.07	.10	.14	.17	.21	.24	.28	.31
52			.11		.18		.25		.32
53	.04							.29	
54				.15		.22	.26		.33
55					.19			.30	
56		.08				.23			.34
57			.12				.27	.31	.35
58				.16	.20				
59						.24	.28	.32	.36
60									
61					.21	.25	.29	.33	.37
62			.13	.17					.38
63		.09				.26	.30	.34	
64					.22				.39
65				.18			.31	.35	.40
66						.27			
67	.05		.14		.23		.32	.36	.41
68						.28			
69				.19			.33	.37	.42
70					.24			.38	.43
71		.10				.29	.34		
72			.15					.39	.44
73				.20	.25	.30	.35		
74								.40	.45
75								.41	.46
76				.21	.26	.31	.36		
77			.16					.42	.47
78		.11				.32	.37		
79					.27			.43	.48
80				.22			.38		.49
81						.33		.44	
82			.17		.28		.39		.50
83	.06					.34		.45	.51
84				.23			.40		
85					.29			.46	.52
86		.12				.35	.41		
87			.18					.47	.53
88				.24	.30	.36	.42	.48	
89									.54
90							.43	.49	.55
91				.25	.31	.37			
92			.19					.50	.56
93		.13				.38	.44		.57
94					.32			.51	
95				.26			.45		.58
96						.39		.52	
97			.20		.33		.46		.59
98						.40		.53	.60
99				.27			.47		
100		.14			.34	.41		.54	.61

APPROVAL OF CHIEF OF PARTY

Sheet number 123 and accompanying records have been inspected and approved by me. The field and office work was done under my immediate supervision at all times. No additional work is considered necessary.

F B T Siems

F. B. T. Siems,
H. & G. Engr.,
Commanding.

Appendix to descriptive Report No. 123.

Method of locating Survey Buoys and derivation of Velocity-- Cordell Bank, Coast of California, 1929.

(see attached projection and computations

Observed data:

(1) Distances and directions to Buoy A from R-A-R position 29X and 30X.

(2) Distance and direction to Buoy B from R-A-R line of position $3A_a$.

(3) Distance and direction to Buoy C from R-A-R line of position $2A_a$.

(4) Position of anchorage X from angles taken between Pt Reyes Light, Farallon Id. Light and Star Sirius.

(5) Azimuths from Anchorage X to buoys B & C from angles taken between buoys B, C and the Sun. (position $1B_b$)

(6) Azimuth of buoy ranges A--B and B--C, from angles taken between the ranges and the Sun. (positions 3 to 11Y and 39A_a)

(7) Log distances between buoys A and B, and B and C. (positions 1 to 6Y and 35 to 43A_a)

Procedure:

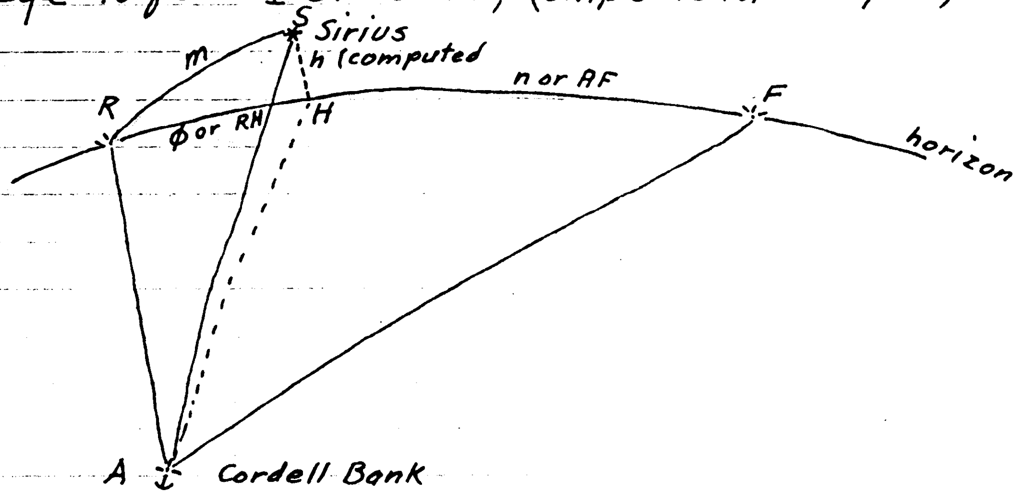
Polyconic projection, scale 1:20,000 prepared. Geographic position of intersection of 35 second Duncan and 60 second Haven circles(assumed velocity 1490m p s) computed and plotted. (see attached projection and computations.) Azimuths from intersection 35s--60s circles to Duncan and Haven R-A-R stations computed and plotted and lines 1490 meters apart drawn normal thereto. Offsets from normal lines computed and plotted for construction of time circles. Geographic Position of anchorage X computed and plotted, and azimuths from the anchorage to Buoys B and C computed and plotted.

Mean position of Buoy A plotted from R-A-R position 29X and 30X, on basis of assumed velocity of 1490 meters per second. (Note: the two Duncan distances for buoy A fall fairly close to one another; these distances control the position of buoy A in a NE and SW direction and as will be seen later, they also control the positions of buoys B and C in a like manner). Azimuth from mean position of buoy A to Buoy B and line of position (R-A-R) buoy B plotted (1490 m V.); the intersection of the last two lines falls about 57 meters southward of the true position line X to B (azimuth from fixed position) indicating that the true velocity is 1.0 meter per second (57/59s) less than the assumed velocity or 1489 m. p. s.

R.A.R. position A(mean) and R-A-R position lines B and C are replotted now on a basis of the true velocity of 1489 m.p.s. Azimuth from new position of A to B then intersects the other two position lines of buoy B in a single point. Azimuth from Buoy B to C is drawn from the new position of Buoy B and its intersection with the the line X--C (azimuth from fixed position) is considered the most probable position of Buoy C, inasmuch as the log distances between the three buoys is in agreement. Line of position of buoy C by R-A-R is considered doubtful and disregarded.

F B T Siems
F.B.T.Siems
H. & G. Engr, Commdg.

At Ship's anchorage, Cordell Bank, Coast of Northern Calif., Dec 4, 1929 pm. Approx Lat. 38°-00'.5 Long. 123°-25'.7, the following direct angles (m) between △ Pt. Reyes LH and ✱ Sirius were observed and times noted by a watch compared with Greenwich chronometer. Also horizontal angle n between △ Pt. Reyes LH and △ Farallon Id. LH. was observed to be 40°-08'-20", Chronometer corrn +11^h 13^m 31^s, C-W.T. -3^h 13^m 03^s, height of eye 10 ft. I.C. -3'-32", (Ship's head 340 ps.c)



				dt		Observed m	dm	$\frac{dm}{dt}$	
W.T.	9^h	02^m	55^s			20°-19'-10"			
		09	30	395^s		21- 30- 00	4250"	10.77	
		12	20	170		21- 59 - 10	1750	10.30	10.72
		14	55	155		22- 28 - 10	1740	11.21	
		18	48	233		23- 11 - 00	2570	11.03	
Totals	45	58	28	953		109 - 27- 30	10310	10.82	

Means W.T.	9^h	11^m	42^s pm Dec 4	
C-W.T.	-3	13	03	
Chro. T.	5	58	39	
C.C.	11	13	31	
GCT	17	12	10 pm Dec 4	
GCT	5	12	10	Dec 5
GST 0^h 5th	4	53	13.5	
Corrn. 5^{h}12^m			51.3	
GST	10 -	06	15.	
Long.	8 -	13 -	43	
L.S.T.	1 -	52 -	32	
RA ✱	6 -	42 -	04	
t ✱	4 -	49 -	32	

observed m	21	53	30
I.C.		- 03	32
m	21° -	49' -	58"

Long 123°-25'.7
8^h-13^m 43^s

(over)

t*	4h-49m-32s	log hav	9.54242
L	38°-00' 33"	log cos	9.89648
d*	-16-36.9	log cos	9.98148
θ		log hav	9.42038
θ.		Nat hav	0.26326
L~D	54°-37'-27"	Nat hav	0.21053
z	86-59'-42"	Nat hav	0.47379
	90°		
h'	3-00-18		
Dip	+03-18 ?		
Refr.	+13-40		
h	3-17-04	log cos	9.999286
m	21-49-58	log cos	9.967676
φ	21-35-46	log cos	9.968390

½t	36°-11'-30"	log cot.	10.135687
S	79-18-10	log cosec	10.007614
D	27-18-44	log sin	9.661660
X	32 32 47	log tan	9.804961
½t		log cot	10.135687
		log sec	10.731378
		log cos	9.948667
Y	81-18-34	log tan	10.815732

L 38°-00'-33"
90
col L 51 59 27
P.D. 106 36 54 = 90 ~ d
2S 158 36 21 = col L + PD.
2D 54 37 27 = PD ~ col L

t 4h 49m 32s
½t 36° 11' 30".

α_N* 113-51-21 (X+Y)
α_S* 293-51-21. = azimuth t to * 293-51-21.
φ 21-35 46
" A to R 272 15 35
180 15 00 see position comp.
" R to A 92 30 35
" R to F 356 43 16
∠ARF 95 47-19

	R-F		
			4.517979
A Anchorage	40°-04-48	40-04-47	0.191213
R Pt Reyes LH	95°-47-19	95-47-18	9.997780
F Farallon LH	(44-07-56)	44-07-55	9.842804
Spherical Excess	03	A-F	4.706972
		A-R	4.551996

Computed & checked [illegible]

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″
α	2 Pt. Reyes LH to 3 Farallon I LH	356	43	16.5
2d ∠	&	+95	47	19
α	2 to 1	92	30	35
Δα			-14	59
		180	00	00.0
α′	1 to 2	272	15	36
	First Angle of Triangle	40	04	47

	°	′	″			°	′	″
φ	37	59	45.57	2 Pt Reyes LH	λ	123	01	20.62
Δφ			48.11		Δλ		24	19.72
φ′	38	00	33.68	1 Anchorage Cordell Bk	λ′	123	25	40.34

	Logarithms	Values in seconds	
s	4.551996	1038.5 (811.5)	
Cos α	8.641364		
B	8.511003		
h	1.704363	1st term	-50.625″
s^2	9.10399		
$\sin^2\alpha$	9.99917		
C	1.29746		
	0.40062	2d term	+2.515
h^2	X		
D			
		3d term	+
		−Δφ	-48.11

	° ′ ″	984.1
$\frac{1}{2}(\phi+\phi')$	38-06-10	(479.6)

	Logarithms	Values in seconds
s	4.551996	
Sin α	9.999583	
A′	8.509168	
Sec φ′	0.103523	
Δλ	3.164270	1459.72″
$\sin\frac{1}{2}(\phi+\phi')$	9.789369	
−Δα	2.953639	899

		°	′	″
α	3 Farallon I LH to 2 Pt Reyes LH	176	44	03.7
3d ∠	&	-44	07	56
α	3 to 1	132	36	08
Δα			-15	43
		180	00	00.0
α′	1 to 3	312	20	25

	°	′	″			°	′	″
φ	37	41	58.28	3	λ	123	00	03.67
Δφ		18	35.42		Δλ		25	36.68
φ′	38	00	33.70	1 Anchorage Cordell Bk.	λ′	123	25	40.35

	Logarithms	Values in seconds	
s	4.706972		
Cos α	9.830527		
B	8.511025		
h	3.048524	1st term	1118.21″
s^2	9.41394		
$\sin^2\alpha$	9.73384		
C	1.29285		
	0.44063	2d term	+2.758
h^2	6.097		
D	2.378		
	8.475	3d term	+0.030
		−Δφ	1115.42

	° ′ ″
$\frac{1}{2}(\phi+\phi')$	37-51-16

	Logarithms	Values in seconds
s	4.706972	
Sin α	9.866920	
A′	8.509168	
Sec φ′	0.103523	
Δλ	3.186583	1536.68″
$\sin\frac{1}{2}(\phi+\phi')$	9.787926	
−Δα	2.974509	943.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
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Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

INVERSE COMPUTATION

			°	′	″
α	2	to 3			
2d ∠		&	+		
α	2 Duncan	to 1 Haven #2	136	23	40
Δα			−	18	23
			180	00	00.0
α′	1	to 2	316	05	17

			°	′	″
α	3	to 2			
3d ∠		&	−		
α	3	to 1			
Δα					
			180	00	00.0
α′	1	to 3			

FIRST ANGLE OF TRIANGLE

	°	′	″			°	′	″
φ	38	23	21.70	2 Duncan magnetophone 61885.m.	λ	123	05	49.70
Δφ	+	24	09.59		Δλ	+	29	28.53
φ′	38	47	31.29	1 Haven #2 hydro-phone	λ′	123	35	18.23

	°	′	″			°	′	″
φ				3	λ			
Δφ					Δλ			
φ′				1	λ′			

	Logarithms		Values in seconds
s	4.651385		
Cos α			
B	8.510973		
h	3.162358	1st term	1453.31″
s^2	~~9.3605~~		
$Sin^2 α$			
C	1.3036		
	0.5641	2d term	+ 3.665
h^2	6.325		
D	2.381		
	8.706	3d term	+ .050
		−Δφ	1449.59

½(φ+φ′)	38° 35′ 26″	
	Logarithms	Values in seconds
s	~~4.630237~~	
Sin α		
A′	8.509149	
Sec φ′	0.108226	
Δλ	3.247612	1768.53″
Sin ½(φ+φ′)	9.795011	
−Δα	3.042623	1103.1

~~4.630232~~
4.651385
9.978852 log tan 4.651335
4.630237 9.859801
9.838654 4.791584
4.791583

	Logarithms		Values in seconds
s			
Cos α			
B			
h		1st term	″
s^2			
$Sin^2 α$			
C			
		2d term	+
h^2			
D			
		3d term	+
		−Δφ	

½(φ+φ′)		
	Logarithms	Values in seconds
s		
Sin α		
A′		
Sec φ′		
Δλ		″
Sin ½(φ+φ′)		
−Δα		

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Dist by plane coordinates
1449″.59 log 3.161245
30.835 m log 1.489044

4.650289 -9.858702 = 4.791587

1768.53 log 3.24761
24.201 m log 1.38383

4.631445- 9.839858 = 4.791587

*136°-14′-33″ log tan 9.981156 * checks mean of for'd and back azimuths

JBW

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25

COMPUTATION OF TRIANGLES

State: California - Cordell Bank

	NO.	STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
		Given the three	sides of a triangle only				From inverse comp.	
		2-3					61885	4.791585
		1 $35^s - 60^s$	(42 25 52)		54"			0.170887
		2Haven #2	(34 39 01)		04"			9.754782
		3 Duncan	(102 55 07)		10"			9.988866
		1-3 $35^s \times 1490$	m				52150	4.717254
		1-2 $60^s \times 1490$	m				89400	4.951338
						2s	203435	
						~~2s~~ log(1-3)	Log(1-2)	9.668592
						s	101717.5	5.007396
		2-3				2-3	61885	
							39832.5	4.600238
		1						9.607634
		2						9.939042
		3	21-12-56					9.969521
		1-3						
		1-2						
		2-3						
		1						
		2						
		3						
		1-3						
		1-2						
		2-3						
		1						
		2						
		3						
		1-3						
		1-2						

Do not write in this margin

For sheet 123 - subsketch
Base velocity 1490 mps

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April, 1929

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2 Haven	to 3 Duncan	316	05	17	α	3 Duncan	to 2 Haven	136	23	40
2d ∠		&	+ 34	39	04	3d ∠		&	− 102	55	10
α	2	to 1	350	44	21	α	3	to 1	33	28	30
Δα			+	6	06	Δα			−	12	09
			180	00	00.0				180	00	00.0
α′	1 35 -60 sec	to 2 Haven	170 42	50 25	27 54	α′	1 35 -60 sec	to 3 Duncan	213	16	21

FIRST ANGLE OF TRIANGLE

	°	′	″			°	′	″		°	′	″			°	′	″
φ	38	47	31.29	2 Haven	λ	123	35	18.23	φ	38	23	21.70	3 Duncan	λ	123	05	49.70
Δφ		47	42.05		Δλ		9	49.65	Δφ	−	23	32.49		Δλ		19	38.90
φ′	37	59	49.24	1 35-60 sec	λ′	123	25	28.58	φ′	37	59	49.21	1 35 -60 sec.	λ′	123	25	28.60

	Logarithms		Values in seconds		Logarithms	Values in seconds
s	4.951336		1518.0 (331.7)	½(φ+φ′)	38 23 40	
Cos α	9.994302			s	4.951338	697.3 (766.6)
B	9.510943			Sin α	9.206635	
h	3.456583	1st term	2861″.43	A′	8.509169	
s²	9.9027			Sec φ′	0.103450	
Sin² α	8.4133			Δλ	2.770592	589″.65
C	1.3098			Sin ½(φ+φ′)	9.793142	
	9.6258	2d term	+ .422	−Δα	2.563734	366
h²	6.913					
D	2.362					
	9.295	3d term	+ .197			
		−Δφ	2862.05			

s′ = 5549.7 m
+ 331.7
5881.4

170° 50′ 27″
9 09 33

3.7694807
9.2074147
402
2.9769356

948.3

for laying off azimuth
35-60 to Haren on smooth sheet
considered better than
protractor.

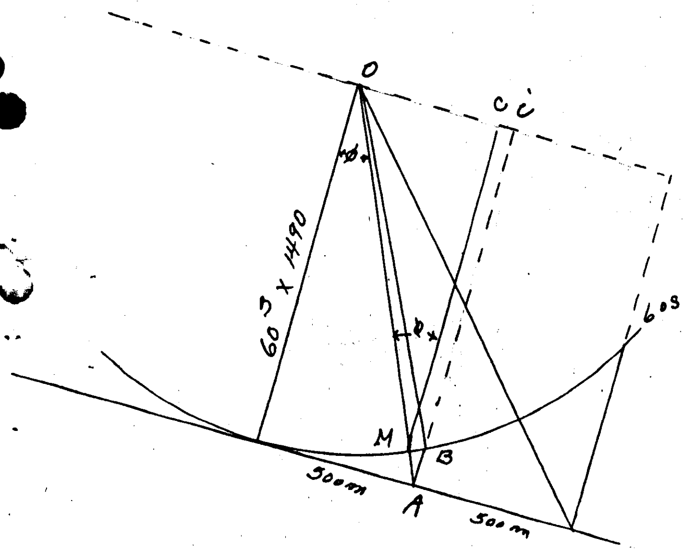
	Logarithms		Values in seconds		Logarithms	Values in seconds
s	4.717254			½(φ+φ′)	38 11 35	
Cos α	9.921232			s	4.717254	
B	9.510973			Sin α	9.741603	
h	3.149459	1st term	1410″.78	A′	8.509169	
s²	9.4345			Sec φ′	0.103450	
Sin² α	9.4832			Δλ	3.071476	1178″.90
C	1.3036			Sin ½(φ+φ′)	9.791208	
	0.2213	2d term	+ 1.668	−Δα	2.862684	729
h²	6.299					
D	2.381					
	8.680	3d term	+ .048			
		−Δφ	1412.49			

° ′ ″
33-16-21
9.8170255
3.7694807
46
3859.3 3.5865106

for laying off
azimuth

comp + checked

OFFSETS as AB FOR CONSTRUCTION OF
TIME CIRCLES (1490 m V.)



$$\tan \phi = \frac{500 \text{ m}}{60 \times 1490}$$

$$\cos \phi = \frac{MC}{60 \times 1490}$$

for very small angles φ MC may be considered equal to BC and

$$\cos \phi = \frac{BC}{60 \times 1490}$$

$$AB = 60 \times 1490 - BC$$

60^s circle offsets		59^s circle offsets		For 58^s est.
for 500m log	2.698970	For 500	2.698 970	
$60^s \times 1490$ "	4.951338	59×1490	4.944038	
log tan	7.747632		7.754932	
" cos	9.999993	87910	9.999993	
89400 BC log	4.951331	87909	4.944031	
89399		1^m		
1^m AB				1^m

For 1000 log	3.000000	for 1000		
	4.951338			
	8.048662		8.055962	
89400	9.999973	.87910	9.999972	
89345	4.951311	87904	4.944010	
5 m		6^m		7^m

For 1500 log	3.176091			
	4.951338			
	8.224753		8.232053	
89400	9.999939	87910	9.999932	
89388	4.951277	87897	4.943975	
12 m		13^m		14^m

For 2000 log	3.301030			
	4.951338			
	8.349692		8.356992	
89400	9.999891	87887	9.999888	
89378	4.951229	23^m	4.943926	
22 m				24^m

For 2500 log	3.397940			
	4.951338			
	8.446602		8.453902	
89400	9.999830		9.999824	
89365	4.951168	87874	4.943862	
35 m		36^m		37^m

For 35^s Circles

500 log	2.698970
35 X 1490	4.717254
	7.981716
52150	9.999980
52148	4.717234
2^m	
1000	3.000000
	4.717254
	8.282746
	9.999920
52140	4.717174
10^m	
1500	3.176091
	4.717254
	8.458837
	9.999820
52128	4.717074
22^m	
2000	3.301030
	4.717254
	8.583776
	9.999680
52112	4.716934
38^m	

For 34^s Circles

500 log	2.698970
34 X 1490	4.704665
	7.994305
50660	9.999979
50658	4.704644
2^m	
	8.295335
	9.999915
50650	4.704580
10^m	
	8.471426
	9.999808
50638	4.704474
22^m	

computed + checked
[illegible]

amo.
#a8

3-DRM

June 17, 1930.

To: Commanding Officer,
U. S. Coast and Geodetic Survey,
Ship DISCOVERER,
202 Burke Building,
Seattle, Washington.

From: The Director,
U. S. Coast and Geodetic Survey.

Subject: Records of R.A.R. work, California.

In the verification of your season's work off the coast of California and in a study being made at this office regarding the transmission of sound through sea water, there is need for information regarding the times when the shore stations were operating, particularly station Farallon. Possibly a log kept at the station would give the desired information.

It is impossible to tell from the bomb record whether the sound failed to reach the hydrophone at the station or whether the station was not operating.

Other parties have usually shown this information in the bomb records, giving the name of the station and a brief note, such as "No return" or "Station not operating", and this practice could well be followed.

In addition, computations of the positions determined from three R.A.R. stations used in computing the velocity of sound are desired. If these are not available, please describe the method used in computing these positions.

(Signed) R. S. Patton

Director.

POST-OFFICE ADDRESS: 202 Burke Bldg.,
Seattle, Washington.

TELEGRAPH ADDRESS: 4th

EXPRESS OFFICE:

1930 JUL -25- AM 3: 57

Attach to D.R. H-4993

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

Str. DISCOVERER

Seward, Alaska,
July 13, 1930.

To; The Director,
U.S. Coast & Geodetic Survey,
Washington, D.C.

From: Commanding Officer,
Str. DISCOVERER.

Subject: Records of R.A.R. work - California.

Reference: The Director's letter of June 17th., ref. 3 D.R.M.

The Farallon R.A.R. station was established and maintained by the party of the PIONEER. Arrangements were made to use this station by the DISCOVERER for a few days when it would least interfere with the work of the PIONEER.

The stations maintained by the DISCOVERER were always operating during the progress of the R.A.R. work with one exception. The Duncan station cable parted before the completion of the location of buoys on Cordell Bank at the end of the season.

It was the practice to attentively record notes concerning non-reception of sound at the hydrophones, or failure of relaying, or receiving the return radio signals by such entries as "not heard", "too weak to trip relay", improper tuning", etc. It is not clear how the second and third paragraphs of the above reference apply to the R.A.R. records of the DISCOVERER, unless only the Farallon station is referred to.

During the time the Farallon station was used by the DISCOVERER as a third station for velocity determinations, the nature of any failures, if these could be ascertained, were also recorded. At times there were four shore stations and two ships operating alternately and any but the most essential radio traffic was avoided. Considerable time was required by the stations to alternately change their wave lengths each time for the DISCOVERER and for the PIONEER.

The periods of time for which arrangements were made for using the Farallon station may be ascertained from the record in that the names of three stations are recorded in anticipation of returns from those stations. If the name "Farallon" does not appear, it was not opperating. In case there is no entry or note opposite "Farallon", it may be assumed that the bomb was not heard, or that it was too weak to trip relay, or that due to improper tuning the return signal was not received.by the vessel.

The R.A.R. rough logs of the DISCOVERER kept by the ship's operators during the 1929 season are forwarded under separate cover, to the Chief, Division of Field Records. The information contained in them was furnished the recorder during the progress of the work for entry into the bomb record.

Determinations of velocities of sound in water from the time elements of three R.A.R. stations returns, were derived graphically. The tabulated velocities for the respective positions given in Lieut. Knox's report, are those obtained by trial. They allow the arcs of dependent distances plotted by reference to the nearest distance circles on the sheet to intersect in a point. On account of the comparatively long distances from the stations, it required a change of only one half meter per second in the trial velocities to bring about a point intersection of arcs from that of an appreciable triangle intersection of arcs, or vice versa. This can be appreciated when it is considered that a change in one half meter per second in velocity will effect each R.A.R. distance forty to fifty meters in the case of eighty to one hundred seconds of elapsed time.

As the distance circles (or time circles) on the R.A.R. sheets were carefully coordinated with respect to the every part of the projection and therefore with respect to each other, there is little likelihood of any errors arising from that score in the graphical determinations of velocities. It is therefore considered that these velocities have been determined within one half a meter per second of values, had they been computed. Unless one or more of the R.A.R. distances are small, it appears that there is nothing gained in practical accuracy by making the laborious distance computations for the determination of velocities from time elements of three R.A.R. station returns.

FBTSiems

F.B.T. Siems
Commanding Officer,
Str. DISCOVERER.

Section of Field Records.

Ecm

April 26, 1930.

Division of Hydrography and Topography:

✓ Division of Charts:

Tide Reducers are approved in
5 volumes of sounding records for

HYDROGRAPHIC SHEET 4993

Locality: **California (Point Arena to Point Reyes)**

Chief of Party: **F. B. T. Siems in 1929**
Plane of reference is **mean lower low water,** reading
0.0 ft. on tide staff at **Point Arena**
~~XXXXXXXXXXXXXX below B. M.~~
5.5 ft. on tabulations at San Francisco.

Condition of records satisfactory except as checked below:

1. Locality and sublocality of survey omitted.
2. Month and day of month omitted.
3. Time meridian not given at beginning of day's work.
4. Time (whether A.M. or P.M.) not given at beginning of day's work.
5. Soundings (whether in feet or fathoms) not clearly shown in record.
6. Leadline correction entered in wrong column.
7. Field reductions entered in "Office" column.
8. Location of tide gauge not given at beginning of day's work.
9. Leadline corrections not clearly stated.
10. Kind of sounding tube used not stated.
11. Sounding tube No. entered in column of "Soundings" instead of "Remarks".
12. Legibility of record could be improved.
13. Remarks.

H A Marmer
Actg Chief, Division of Tides and Currents.

Field Records Section (Charts)

HYDROGRAPHIC SHEET No. 4993

The following statistics will be submitted with the cartographer's report on the sheet:

Number of positions on sheet	758
Number of positions checked	520
Number of positions revised	3
Number of soundings recorded	6586
Number of soundings revised	NOT RECORDED
Number of signals erroneously plotted or transferred	NONE

Date: SEPT. 2, 1931

Cartographer: W.H. Bamford

SECTION OF FIELD RECORDS

REPORT ON HYDROGRAPHIC SHEET No. 4993

SEPTEMBER 2, 1931.

SURVEYED IN - 1929

CHIEF OF PARTY - F.B.T. SIEMS

SURVEYED BY - F.B.T. SIEMS

PROTRACTED BY - HERMAN ODESSEY

SOUNDINGS PLOTTED BY - HERMAN ODESSEY

VERIFIED & INKED BY - W.H. BAMFORD & A.L. SHALOWITZ

1.) The records were found to conform to the requirements of the General Instructions for Field Work.

2.) The plotting of positions was found to have been very well done.

3.) The soundings were fairly well plotted - the largest number of mistakes being made in plotting the soundings, was where the bomb position was not taken exactly where a sounding was taken i.e. a position in the bomb record was not always taken at the same time that the identical position was marked in the sounding record - thus confusing the ~~ne~~ plotting the smooth sheet.

4/ The sounding line crossings were found to be adequate.

5/ The development of the only shoal of importance on this sheet, i.e. Cordell Bank was developed on a scale of 1:40,000 and is thought to be sufficient.

6./ It was possible to draw the usual depth curves.

7./ The sheet was dirty - but the work was found to be legible.

8./ The field plotting was completed to the extent prescribed in the Hydrographic Manual.

9./ ~~There were no previous surveys of the area covered by this sheet.~~

The junction with H. 4992 was found to be satisfactory.

The junction with H-4987 was found to be very good.

The junction with H-4988 was found to be satisfactory.

The junction with H 4980-a was found to be satisfactory.

10./ Attention is called to the fact that the R.A.R. positions in the Sub. Plan were plotted by using

the scaled time determination
without any correction for difference
between assumed velocity of sound
and actual velocity of sound as
the time arcs were constructed
using the actual velocity of sound
of 1489 meters per second.

In Latitude 38°-10' and Long 123°.22'
(approximately) - is shown a number
of soundings in blue - These soundings
fall off the limits of H.4988 and
consequently are plotted on this
sheet. None of the soundings
in blue appear on H-4988 - as
indicated by the note in blue
on this sheet.

The slope corrections to the
soundings on this sheet were
eliminated whenever possible
in accordance with regulations

appearing in Special Publication #165 "Slope Corrections for Echo Soundings". No single sounding or isolated group of soundings were corrected for slope, even though the slope was excessive.

The verification and inking of this sheet was started by A. L. Shalowitz and approximately 50% completed by him - It was then taken up by the writer and entirely completed.

Respectfully Submitted.

Warren H Bamford

IN REPLY ADDRESS THE DIRECTOR
U. S. COAST AND GEODETIC SURVEY
AND NOT THE SIGNER OF THIS LETTER

AND REFER TO NO. 80-DRM

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

WASHINGTON

November 11, 1931.

SECTION OF FIELD RECORDS

Report on Hydrographic Sheet No. 4993

Point Reyes to Havens Anchorage - Offshore, California

Surveyed in 1929

Instructions dated March 25, 1929 (DISCOVERER)

Fathometer Soundings - Bomb Control

Surveyed by F.B.T. Siems

Chief of Party, F.B.T.S.

Protracted and soundings plotted by Herman Odessey

Verified and inked by A. L. Shalowitz, W. H. Bamford

1. This review has been made with a view to expediting the reporting of the sheet to Charts in order that it might be applied to Chart 5502 before its next printing. Therefore only those points have been considered that might affect the compilation. The sheet is so full of possibilities for study and investigation that it is thought the best interests would be served if a special job is made of this at some more opportune future time.

Some of the points to be considered would be the following:

a) The use of time arcs instead of distance arcs.

b) Method of determining a sound velocity for Cordell Bank and locating survey buoys on the bank - Correctness of the velocity used.

c) A study of bomb returns

d) Accuracy of fathometer soundings

e) Further studies in sound velocity from information contained in this survey, particularly with a view to determining the effect of Cordell Bank on the transmission of sound.

It is believed that anything that will be derived from the above studies will not materially affect the chart and therefore their immediate consideration is not essential.

2. The work is in conformity with the Hydrographic Manual and with the specific instructions. However, more bottom characteristics would have been desirable at the western limit of the sheet. This could have been accomplished without a reduction in the accuracy of the work since the outer portion was controlled in most cases by bomb fixes without resorting to "dead reckoning."

3. In general there is a good agreement in the sounding line crossings. There are a few cases where discrepancies of about 50 fathoms occur in depths over 1000 fathoms. The recommendations of the Chief of Party that the mean value be used in such cases was not accepted, because it would still leave in error the soundings on both lines approaching the crossing and to correct these would be too much like making an office survey. By having the soundings as actually obtained it serves a two-fold purpose; first, it indicates the limitations of the method and secondly, it might form the basis for a further study of the sound velocities used with a view towards shifting some of the R.A.R. lines.

4. The junctions with all the contemporary surveys bordering this sheet have been examined and found satisfactory.

5. Comparisons with old surveys on Cordell Bank

H. 1298a: This survey was made in 1873 and with the exception of one or two lines was controlled by dead reckoning. In general there is a good agreement with the present survey inside the 50 fathom curve, but outside this curve there are marked discrepancies. These are probably due to the adjustment of the dead reckoning lines. The old records for this survey could not be located in the archives and no study of this was therefore possible. No essential information is, however, contained in the old sheet that has not been developed on the new survey. The former work in this area can therefore be superseded.

H. 3224: This survey was made in 1911, the control used being mountain peaks. The only sounding of importance on this survey that falls within the limits of the new survey is the 30 fathom charted sounding at the northwestern end of Cordell Bank just inside the 100 fathom curve. Because it falls outside the 50 fathom curve on the new survey, it was investigated in the original record and found that the location is of doubtful accuracy. (See note bottom of page 17 of sounding volume for H. 3224 - pos. 30 B) The sounding should therefore be ignored in the new compilation.

The balance of the soundings on H. 3224 that fall within the limits of the new survey, while not important, were also investigated to see whether or not there was a general agreement with the new work. There appears to be a displacement of the old soundings, sometimes falling too far offshore and sometimes too far inshore by approximately 3/4 mile. It is believed that this is due to the character of the control on the old survey since one of the points used was the "highest point on Pt. Reyes" which may not have been accurately located on the chart on which the work was plotted. It is not very likely that the new work is displaced, since that could only be accounted for by an erroneous velocity of sound which error would have to be of such magnitude as almost to take it out of the range of possible theoretical values. This phase will, however, be considered when the matter of velocity is taken up in the study that is proposed. As far as the charts are concerned it is not recommended that the old work be used since no critical soundings are involved and since the new work presents a harmonious whole it would be unwise to add soundings that are not in keeping with the general configuration.

6. No additional work is recommended for this area.

7. Results of survey

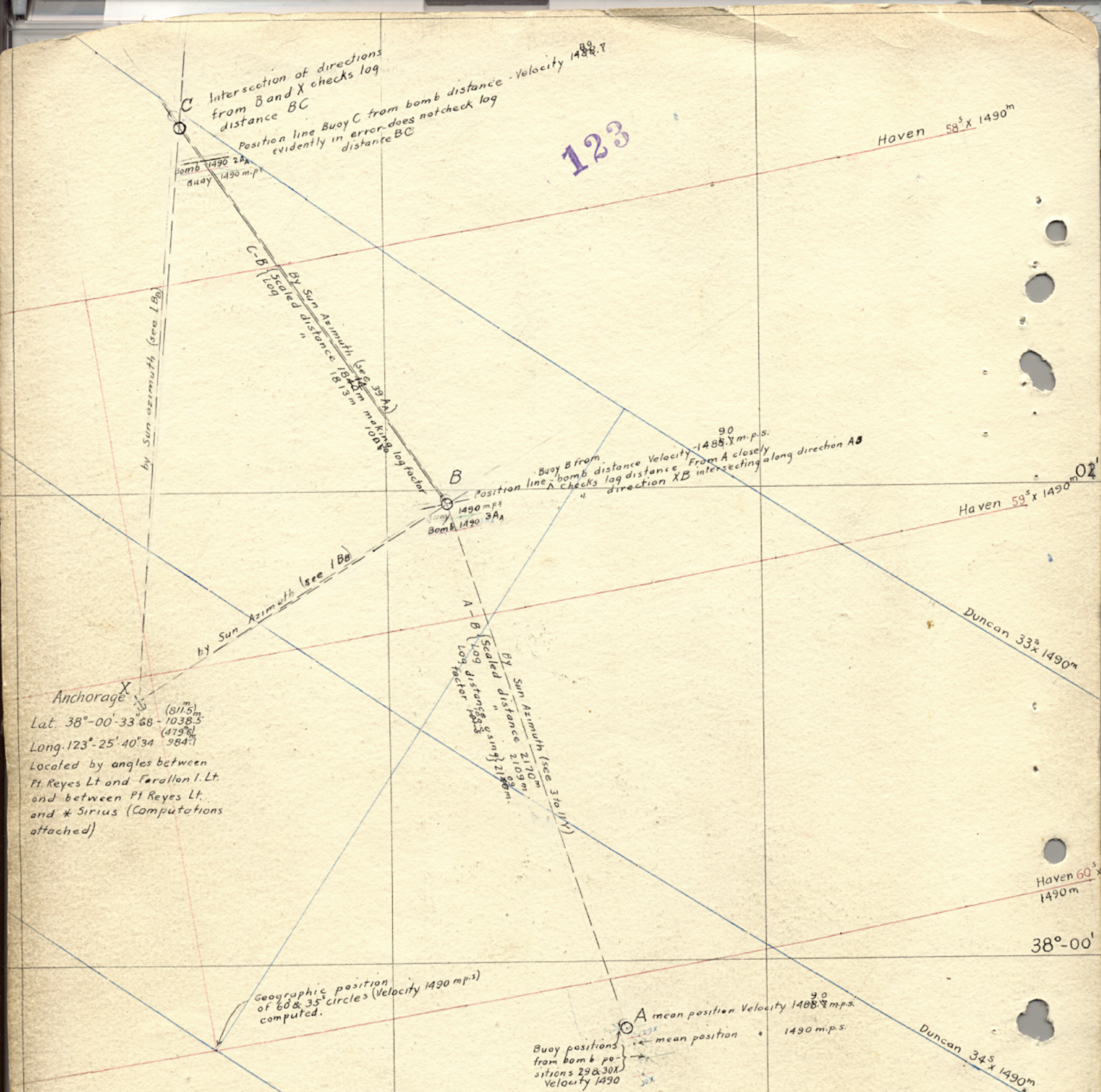
In concluding this report it should be stated that this sheet is perhaps one of the finest specimens of work executed by the new methods that has come to the attention of the writer. With lines running 70 to 80 miles offshore and in depths well over 2000 fathoms, the sheet presents the appearance of a well planned and orderly survey such as would be expected when operating close to shore. That a tremendous step forward has been made in adopting the acoustic method of surveying is almost axiomatic at this late date, nevertheless 2100 statute miles of soundings (consisting of 6600 soundings) in 26 days in depths ranging from 20 to 2100 fathoms and comprising an area over 3000 square nautical miles, including a large scale development of an important offshore bank, is still an enviable record which should not pass unnoticed. The Chief of Party is to be highly commended for the splendid results obtained.

8. Reviewed by A. L. Shalowitz, November 1931.

Approved:

A. M. Sobieralski
Chief, Section of Field Records

F. B. Borden
Chief, Section of Field Work



LOCATIONS
OF
SURVEY BUOYS A, B & C
CORDELL BANK
1/20,000
FOR SHEET 123
Coast of Northern Calif.
US.C&GS.S. DISCOVERER
F. B. T. Siems, Comdg.
1929

VELOCITY DETERMINATION DERIVED FROM DATA ON THIS SHEET IS 1488.9 m.p.s.

1 to 6 Y	Log.	Diff	35 to 43 A	Log	Diff
B	26.65		C	37.25	
A	27.85	1.20	B	38.20	.95
A	29.21		B	39.37	
B	30.28	1.07	C	40.39	1.02
B	31 40		C	41.30	
A	32.57	1.17	B	42.23	.93
A	*33.85		C	Mean	.94
B	*35.05	1.20	B		1.02
	Mean	1.14m		Mean	.98
Dist. A to B		2109m	Dist. B to C		1813m

*One log evidently misread 0.1

26' 123° 25' 24' 37°-59'

NAUTICAL CHARTS BRANCH

SURVEY NO. ________

Record of Application to Charts

DATE	CHART	CARTOGRAPHER	REMARKS
4-2-64	5072 New Chart	Earl W. Broggi	~~Before After~~ After Verification and Review Compared.
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review

M-2168-1

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.